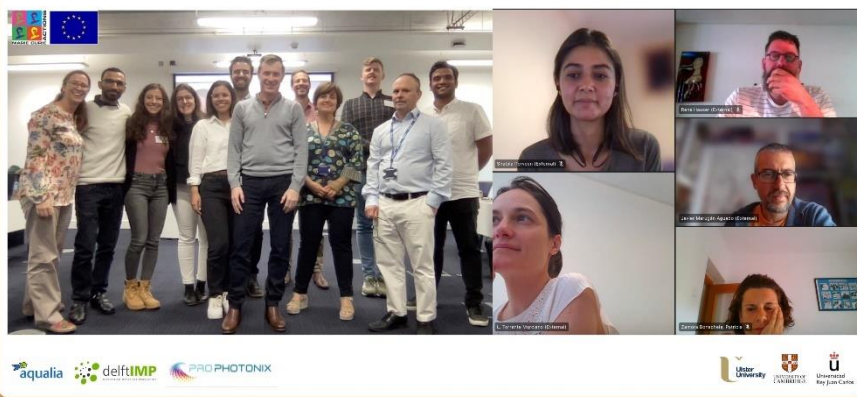


Project Progress

REWATERGY HYBRID MEETING M39, June 22nd 2022



The project has 6 months left to finish, however, due to the delays suffered during the Covid-19 pandemic, an extension of the project for another 6 months has been requested, which has already been approved by the European Commission. These extra 6 months will allow us to advance a little more in the objectives of the project and extend the student contracts for a while.

To conclude with the last training of the **REWATERGY** project, the *Final Showcase and International Workshop* will be held at

the end of October in Jerez de la Frontera (Spain). In this event, external speakers will participate in the project and our students will have the opportunity to present their latest results. We will also hold the last annual meeting.

Our ESRs talk about his/her experience

Last but not least, Shabila Perveen & Marina Avena Maia write in this number about their **REWATERGY** experience with us. Thank you very much for sharing!!

Marina Avena Maia

In October 2019, I joined the **REWATERGY** Marie Curie European Industrial Doctorate and it has been an extremely enriching experience so far. I am currently a 3rd year PhD candidate at the University of Cambridge and am also gaining experience in the private R&D sector by working at Delft IMP – a start-up company in the Netherlands. One thing that I could have never foreseen is that I would be developing my PhD project during a world pandemic.

Shall we start at the beginning? Well, my first stop at the **REWATERGY** Programme was at Cambridge, in England. During my undergraduate studies, I lived for one year in Scotland and I still cherish the lovely memories that I have from that time. So naturally, I was looking forward to living again in the United Kingdom and joining this prestigious PhD Programme. Cambridge is a lovely city and I immediately felt at home. I easily became a fan of British humour and the local culture, so adjusting to England was a smooth ride. Regarding my PhD, I worked for one year and a half at the Catalysis and Process Integration group (CAPI). The group, which is led by Dr Laura Torrente-Murciano, is a diverse group of talented researchers from all over the world. The working atmosphere is collaborative and supportive, unless when we are trying to decide whose music playlist we are putting next



Left) Performing characterization analysis at the University of Cambridge. Right) Barbecue time with the Catalysis and Process Integration group (CAPI).



(spoiler alert: rock solves all the conflicts). Abruptly, after only 4 months of working in the CAPI group the COVID-19 pandemic hit. The University closed for 5 months, so I could not do any experimental work. During that time, I focused on literature review research whilst working from home. After the University re-opened, I felt like I was on an iron-man marathon, but instead of swimming, cycling and running, I was doing experiments, analysis, and data interpretation against the clock. I was extremely worried about the time that I lost during the pandemic. I felt like I was constantly running against time to acquire the most amount of data I could. Pandemic or no pandemic, I guess the PhD is not for the faint-hearted, right?



Marina working at Delft-IMP, in The Netherlands.

After one year and a half in Cambridge, I moved to Delft in The Netherlands for my industrial placement at Delft-IMP. It was more challenging to readjust to a new country where I faced problems with immigration, finding accommodation and learning how to cycle on the right lane again. A good trade-off was to discover the delicious apple pie and the stroopwafels, which brought me comfort when I was missing Cambridge, my family and my friends. At Delft-IMP, I learned about the coating processes and deepened my materials science knowledge even more. In December 2022, I will move back to Cambridge and work on finishing my thesis manuscript. I still feel I am like

participating in a long iron-man marathon, but this time, with 4 PhD research awards under my belt, I can see the finish line.

Shabila Perveen

My early educational journey started in my hometown in the Hunza Valley, and I moved to Pakistan to attain higher education. I arrived in Madrid in October 2019 to join the **REWATERGY** Project as an early career researcher. Before my arrival, I was full of curiosity about the countries and people I will work with during the three years. I was more excited to start building the foundations of a career in research as an early-stage researcher. For me, it was a start of a life changing experience, in two scientifically advanced countries, Spain, and Ireland.

I completed my initial 18 months at the Universidad Rey Juan Carlos Madrid. I started my work by re-learning all the research techniques. I found the research staff and fellows very friendly. Although I had traveled few places before, never had I imagined travelling alone. I took up the opportunity to fulfill my solo traveling dream. I visited new cities in Spain and shared my experience through social media with the online community. Each city inspired me differently, the various forms of art, the diverse culture, the layers of different history, and the taste of locals were reflected in each place I walked through. The coexistence of modern development and the preserved remains of the past was so visible. I was so glad I had the opportunity to learn things outside formal education and my research.

During the Covid period, I utilised my restriction period on learning the Spanish language through online courses. Although I learned the language for basic communication, it gave me great pleasure to be able to communicate and enjoy Spanish television programs. In this period, we received the impacts of the evolving



Shabila Perveen standing at the Cliffs of Moher in Ireland, a natural landmark.



Shabila Perveen from the theatre performance of the show, "SEVEN" with the Madrid players

uncertainties and heart-breaking news from all around the World. The moral support from our families, the **REWATERGY** project, and the professors, friends, and fellows helped a smooth transition to the post-Covid period. This was a realisation that we may live in different countries, with different ways of life, but the problems facing humanity are common. A disaster or a pandemic knows no boundaries. A single country prepared for a disaster is not sufficient to overcome the impacts. Our present and future demands more collective actions than ever before. Therefore, a

period in the **REWATERGY** project taught me life-long lessons, about living in an entirely different country and situations.

With the arrival of Covid vaccine, new hopes were restored, and we were able to resume our laboratory experimental work after three months of closure. At the end of my academic placement, I further faced five months delay in fulfilling the legal procedures to work and travel to Ireland. It could have been difficult but with the regular technical support from the **REWATERGY** team and EURAXESS Ireland, I was able to continue my industrial placement in Ireland. At the end of my stay in Spain, I got a chance to play in a theatre show, my first performance in Madrid. It was an outstanding opportunity for me to play together with amazing actors from six different countries. In summary, in Spain, I received more support than I expected, made more friends than I anticipated, and learned things beyond the project activities.

I started my industrial placement at ProPhotonix Limited Ireland. Being part of a company was a whole different experience than academia. Although previously, I had only read about laser and UV-LEDs based technologies, at the company I worked around people involved in manufacturing, testing, and delivery of the products to customers from various application areas. This was where I saw the translation of research-generated data into real applications.

The natural beauty of Ireland is breathtaking. The Irish people's sense of humour is on another level. With a low population, diverse communities, smaller cities, and cozy towns, it took very less time to integrate into the country. During my travel through the country, I explored a whole new world, history, and culture. I realised how limited my knowledge on other cultures had been, this program gave me the opportunity to expand my understanding of diverse social systems. I continue sharing my research findings through international conferences and publications with the research community. Moreover, the nature and beauty of Ireland motivate me to post frequent stories on social media. My work is in progress in Ireland, but I could see I am continuously growing in many ways. The **REWATERGY** project provided me with an opportunity to grow professionally and personally.

✓ M39 meeting

M39 meeting were held in Belfast face-to-face and were organised by Ulster university. This has been the first meeting that has been held in person since the restrictions of the pandemic. On this occasion, the meeting coincided with the Environ 2022 Conference allowing the students to present their research work in a special session on **REWATERGY** included in the conference.



Photos from the ESRs presentations carried out during ENVIRON 22 Conference (Belfast).

The Congress was a success, there were very interesting presentations such as the one by Prof. Kevin McGuigan on Sustainable Development Goals or the plenary entitled "Ireland towards the net zero challenge!" from Prof. Neill J. Hewitt among others. The social gathering was organised with a visit to Giants Causeway, a popular day tour, and the conference dinner on Tuesday evening at Hilton Hotel. There were reunions with colleagues and friends from other universities and research centres such as UCC Ireland, the UCC interdisciplinary Institute in Cork and the SAFEWATER search centre, and we met again with colleagues from other projects such as the PANIWATER project.



Photos collected from the encounter in the ENVIRON 22 Conference (Belfast).



There were also prizes!! Our students Marina Avena Maia and Adriana Rioja Cabanillas were awarded two prizes for the Best Nano-related Presentation and the Best Chemical Sciences presentation, respectively.

Finally, the General Assembly was celebrated on June 22nd in Ulster University facilities. We had the opportunity to hold a hybrid meeting to overview the most important topics that affect the development of the project. One of the topics discussed and voted on was the extension of the project and the particular analysis of each of the ESRs' progress.

✓ Next meeting & Final Showcase and International Workshop in Jerez de la Frontera

During the 43rd month, we will hold the six-monthly SA/SB meeting and the last training course that will consist of a Final Showcase and International Workshop with guest speakers who will give us talks about their experience on issues related to the project. The event will be held in Jerez de la Frontera (Spain) and is organised by AQUALIA. The organisation has planned to do several events such as a visit to a local winery and a social dinner for the participants.

Last meetings

Due to the six-month extension of the project, a new meeting has been included. Therefore, in this last year two more meetings will be held:

- The **M48 GA/SB** meeting that will be held in ProPhotonix facilities on March 2023 in **Cork (Ireland)**
- The **M54 GA/SB** Final Meeting that will be held in the URJC during September 2023 in **Madrid (Spain)**

🏛️ Congresses

Celebrated congresses

The return to normality has allowed us to attend congresses in person. These last months have been very fruitful in terms of participation in congresses.

- 🌀 **M. Avena Maia, R. Hauser, L. Torrente-Murciano.** Phosphate recovery from urine waste streams is to be used as a fertiliser. IWA Wastewater, Water and Resource Recovery Conference. Online, 10th -13th April 2022. *Oral presentation.*
- 🌀 **R. Asiain-Mira, P. Zamora, F. Rogalla, V. Monsalvo, L. Torrente-Murciano.** From waste to resource: Energy recovery from human urine. Wolfson Research Event. Cambridge (United Kingdom). 29th -30th April 2022. *Oral presentation.*
- 🌀 **R. Pizzichetti, C. Pablos, K. Reynolds, S. Stanley, J. Marugán.** Membranes' performance assessment for microplastic removal – recovery and recycling perspectives. IWA Wastewater, Water and Resource Recovery (WWRR) Online Conference, 10th – 13th April 2022. *Poster presentation.* Presentation available at: <https://youtu.be/afhlTgdI9P4>
- 🌀 **A. Rioja-Cabanillas, R. Hauser, P. Fernandez-Ibanez, J.A Byrne.** Photoelectrochemical removal of nitrogen compounds from wastewater. 23rd Netherlands Catalysis and Chemistry Conference. Noordwijkerhout (NL), 9th - 11th May 2022. *Poster presentation.*



- ✿ **A. Rioja-Cabanillas, S. McMichael, R. Hauser, P. Fernandez-Ibanez, J.A. Byrne.** Photoelectrochemical removal of urea in wastewater using WO₃. 11th European Conference on Solar Chemistry and Photocatalysis: Environmental Applications. Turin (IT), 6th - 10th June 2022. *Flash Oral presentation.*
- ✿ **R. Asiain-Mira, P. Zamora, V. Monsalvo, L. Torrente-Murciano.** Energy recovery from the urea present in human urine. CEB Research Conference. Cambridge (United Kingdom). 13th -14th June 2022. *Oral presentation.*
- ✿ **M. Avena Maia, R. Hauser, L. Torrente-Murciano.** Scratching the surface: atomic layer deposition of ZnO on SiO₂ for phosphate adsorption. Chemical Engineering and Biotechnology Research Conference (England), 13th -14th June 2022. *Oral presentation.*
- ✿ **R. Pizzichetti, C. Pablos, K. Reynolds, S. Stanley, J. Marugán.** Microfiltration membrane fouling by microplastics: kinetic and mechanistic aspects at different operating conditions. MICROPOL 2022, 12th Micropol & Ecohazard Conference 2022, 6th - 10th June 2022, Santiago de Compostela, Spain. *Poster Presentation.*
- ✿ **P. Shabila, C. Pablos, K. Reynolds, S. Stanley, and J. Marugán.** Selective antibiotic-resistant elements in microplastic biofilm grown in synthetic wastewater and effluent under controlled conditions. 12th Micropol & Ecohazard Conference. 6th -10th June 2022. *Oral presentation.*
- ✿ **R. Pizzichetti, C. Pablos, K. Reynolds, S. Stanley, E. Moore, J. Marugán.** Removal of emerging contaminants by UVC and UVB-LEDs driven AOPs. Environ 2022 “Unlocking Sustainability”, 20th - 22nd June 2022, Ulster University, Belfast, (UK). *Oral Presentation*
- ✿ **A. Rioja-Cabanillas, S. McMichael, R. Hauser, P. Fernandez-Ibanez, J.A. Byrne.** WO₃ photoanodes for the oxidation of urea in wastewater and hydrogen production. 32nd Irish Environmental Researchers Colloquium, Belfast (UK), 20th – 22th June 2022. *Oral presentation. Best Chemical Sciences Presentation.*
- ✿ **M. Avena Maia, R. Hauser, L. Torrente-Murciano.** Phosphate capture by atomic layer deposition-based materials. 32nd Irish Environmental Researchers Colloquium, Belfast (UK), 20th – 22th June 2022. *Oral presentation. Best nano-related presentation award.*
- ✿ **R. Asiain-Mira, P. Zamora, V. Monsalvo, L. Torrente-Murciano.** Adsorption of urea from human urine and subsequent hydrogen production. 32nd Irish Environmental Researchers Colloquium, Belfast (UK), 20th – 22th June 2022. *Oral presentation.*
- ✿ **S. Alkharabsheh, P. Zamora, V. Monsalvo, F. Rogalla, J.A. Byrne, P. Fernández-Ibáñez.** Novel electro-assisted UVA-photocatalytic reactor based on rGO-TiO₂ composite photoanode for wastewater treatment. 32nd Irish Environmental Researchers Colloquium, Belfast (UK), 20th – 22th June 2022. *Oral presentation.*
- ✿ **C. Reddick, C. Sotelo-Vazquez, K. Reynolds, S. Stanley, C. Pablos, J. Marugán.** Photoelectrocatalytic removal of *E. Coli*, MS2, and methanol using nanostructured WO₃/BiVO₄. 32nd Irish Environmental Researchers Colloquium, Belfast (UK), 20th – 22th June 2022. *Oral presentation.*

- 🌀 **A. Pai Uppinakudru, Cintia Casado, Ken Reynolds, Simon Stanley, Cristina Pablos¹, Javier Marugán.** Synergistic effect of 3 wavelengths for inactivation of *E. coli*. 32nd Irish Environmental Researchers Colloquium, Belfast (UK), 20th – 22th June 2022. *Oral presentation.*
- 🌀 **A. Pai Uppinakudru, Miguel Martín-Sómer, Ken Reynolds, Simon Stanley, Cristina Pablos, Javier Marugán.** Prediction of radiant intensity using analytical and numerical simulation techniques. 32nd Irish Environmental Researchers Colloquium, Belfast (UK), 20th – 22th June 2022. *Poster presentation.*
- 🌀 **R. Pizzichetti, C. Pablos, K. Reynolds, S. Stanley, E. Moore, J. Marugán.** Removal of emerging contaminants by UVC and UVB-LEDs driven AOPs. 32nd Irish Environmental Researchers Colloquium, Belfast (UK), 20th – 22th June 2022. *Oral presentation.*
- 🌀 **A. P. Uppinakudru, K. Reynolds, S. Stanley, C. Pablos, J. Marugán.** Critical assessment of optical sensor parameters for the measurement of ultraviolet LED lamps. Measurement, Sensor Systems and Applications Conference 24th – 26th August 2022, Online and On Demand. *Oral Presentation and Science Talk.*
- 🌀 **M. Avena Maia, R. Hauser, L. Torrente-Murciano.** Phosphate recovery from wastewater streams using ZnO materials synthesised by atomic layer deposition. European Materials Research Society (E-MRS) Conference - Fall Meeting (Poland). 19th -22nd September 2022. *Oral presentation.*
- 🌀 **A. Rioja-Cabanillas, P. Fernandez-Ibanez, R. Hauser, J.A Byrne.** WO₃ photoanode for the removal of urea coupled to H₂ production. 2022 Fall Meeting-European Materials Research Society. Warsaw (PL), 19th – 22nd September 2022. *Oral presentation.*
- 🌀 **P. Shabila, C. Pablos, K. Reynolds, S. Stanley, and J. Marugán.** Are microplastics in fresh- and wastewater potential contributors to antibiotic resistance? 15th Conference of the UK Water Network on Potable Water Treatment and Supply, Cranfield (UK). 28th September 2022. *Oral presentation.*







Photos at the top, Raffaella Pizzichetti & Shabila Perveen in the Micropol & Ecohazard Conference 2022 in Santiago de Compostela (Spain). Photos at the bottom, Adriana Rioja Cabanillas & Marina Avena Maia in the European Materials Research Society Conference - Fall Meeting (Poland)



Publications

REWATERGY has four new scientific publications available at the Zenodo repository site (<https://zenodo.org/communities/rewatergy/?page=1&size=20>).

-  **Shabila Perveen, Cristina Pablos, Ken Reynolds, Simon Stanley, Javier Marugán.** Microplastics in fresh-and wastewater are potential contributors to antibiotic resistance-A minireview. Journal of Hazardous Materials Advances 6 (2022) 100071-100083.
<https://doi.org/10.1016/j.hazadv.2022.100071>
-  **Perveen, Shabila, Cristina Pablos, Ken Reynolds, Simon Stanley, and Javier Marugán.** Growth and prevalence of antibiotic-resistant bacteria in microplastic biofilm from wastewater treatment plant effluents. Science of The Total Environment (2022): 159024.
<https://doi.org/10.1016/j.scitotenv.2022.159024>
-  **Adithya Pai Uppinakudru, Ken Reynolds, Simon Stanley, Cristina Pablos, Javier Marugán,** Critical assessment of optical sensor parameters for the measurement of ultraviolet LED lamps. Measurement 196 (2022) 111278-111285, ISSN 0263-2241
<http://dx.doi.org/10.2139/ssrn.4019490>
-  **Ruben Asiain-Mira, Collin Smith, Patricia Zamora, Victor Manuel Monsalvo, Laura Torrente-Murciano.** Hydrogen production from urea in human urine using segregated systems. Water Research 222 (2022) 118931 - 118941.
<https://doi.org/10.1016/j.watres.2022.118931>



Dissemination and Communication activities

During this month **REWATERGY** has been represented by our ESRs in several events.



Rubén Asiain-Mira presenting a talk in the Wolfson Research Event (UK)

Ruben Asiain presents his project

REWATERGY was present in the **Wolfson Research Event** organised by Wolfson College, from the University of Cambridge. Our ESR 3 – **Rubén Asiain-Mira** presented his project on energy recovery from human urine to a broad audience in a multidisciplinary event. From philosophy to machine learning, the conference hosted a wide number of presentations from different fields carried out by Wolfson members. In Ruben's words: "Presenting your work to such a diverse audience is a challenge. As researchers, we are used to attending conferences where everyone works in similar fields, so discussing with people from

so different backgrounds gives you a different perspective on your work. All the presenters did a great job and I enjoyed being able to learn a bit about topics far from my research such as the roles of schools in South Africa!"



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The event was recorded and the presentations are available online:

<https://www.wolfson.cam.ac.uk/about/events/wolfson-research-event-day-1>

<https://www.wolfson.cam.ac.uk/about/events/wolfson-research-event-day-2>

REWATERGY – Energy recovery from urine reaches Madrid!

One of the projects developed in **REWATERGY** consisting of the recovery of energy from human urine starts a proof of concept in the main office building from Aqualia in Madrid. This initiative, led by Aqualia and the University of Cambridge and carried out by our ESR 3 – **Rubén Asiaín-Mira**, aims to provide statistical information on the potential of hydrogen production from urine in a real scenario. For this purpose, activated carbon is placed in some men urinals in the building (see photo). The used carbon is replaced weekly with a fresh one and sent to ESR 3 to analyse the hydrogen production.

This proof of concept also aims to raise awareness of the potential that human urine has to be transformed from waste to a source of green energy. Informative figures are placed next to the toilets with the solution quantifying the impact of its implementation in the building (see photos). The initiative was promoted well on social media to reach more people.



Photo at the left, urinal with activated carbon installed in Aqualia's office in Madrid. Photo at the right, detail of the picture deployed next to the toilets with the REWATERGY solution.

Early Career Researchers Talks

Shabila Perveen gave a talk on her research at, “Early Career Researchers Talks” at the Environmental Research Institute (ERI), University College Cork (UCC), Ireland on 8th June, 2022. It was attended by the research staff of the ERI and other ESRs. The objective was to communicate research results to other researchers and open discussion.

Participation in the 25 anniversary of the URJC



REWATERGY stand at the “25 anniversary. From Tradition to Innovation” in Móstoles campus organized by the URJC.

REWATERGY participates in the exhibition for the “25 ANNIVERSARY. FROM TRADITION TO INNOVATION” organised by the URJC to propose a digital and, in some cases, interactive journey through its present, past and future, on the occasion of its 25th birthday.

The itinerant exhibition presents the history, the present and the possible future of the institution through a digital sample that will travel through the university campuses during this first quarter and was installed on the campus of Móstoles until

the 27th of September.




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Awards

More prizes!!!

 **Marina Avena Maia** was awarded the **Best poster presentation award** at the Chemical Engineering and Biotechnology Research Conference celebrated online from 23rd to 25th of June 2021. Poster presentation.

 **Marina Avena Maia** was awarded the **Best nano-related presentation** in the 32nd Irish Environmental Researchers Colloquium celebrated in Belfast (UK). 20th – 22nd June 2022.

 **Adriana Rioja-Cabanillas** was awarded the **Best Chemical Sciences Presentation** by an Early Career Researcher in the 32nd Irish Environmental Researchers Colloquium celebrated in Belfast (UK). 20th – 22nd June 2022.

 **Marina Avena Maia** has been awarded for the second consecutive time **at the 3 Minutes Thesis Competition** at the European Materials Research Society (E-MRS) Conference-Fall Meeting held at Warsaw University of Technology from 19th to 22nd September 2022. Towards the circular economy: phosphate recovery from waste streams.



Adriana Rioja Cabanillas y Marina Avena Maia with their prizes in the ENVIRON 22 Conference (Belfast).



Marina Avena Maia at the E-MRS Conference at Warsaw University of Technology (Poland).

Other dissemination activities



The **REWATERGY** website is updated with the last meetings, training courses, and dissemination events.

Visit our page at www.rewatergy.eu



You can visit our **student's Blog** from the website of **REWATERGY** (<http://rewatergy.eu/archivos/category/blog>). Every month, one of our students will participate in some reports related to the project. You can already read the last entry "*Hydrogen economy*" written by **Adriana Rioja Cabanillas**. We encourage you to visit it and participate.



Remember, we are on **Twitter**. You can follow us in **@REWATERGY_EID**

We follow **718** people, companies, and institutions, we have **362** followers, and we have posted **436** Tweets.